

MANGAL ROY

Assistant Professor

Department of Metallurgical and Materials Engineering
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Education

- Doctor of Philosophy** in Materials Science and Engineering **August 2010**
Washington State University, USA **GPA: 3.75/4.00**
Thesis title: "Calcium Phosphate Coating on Titanium Using Laser and Plasma Spray"
Advisor: Professor Susmita Bose
- Master of Technology** in Ceramic Engineering **July 2005**
Institute of Technology, Banaras Hindu University, INDIA **GPA: 8.84/10.00**
Thesis title: "Synthesis and Characterization of Nano Hydroxyapatite and Electrophoretic Coating on Ti6Al4V"
Advisor: Professor Devendra Kumar
- Bachelor of Technology** in Ceramic Technology **July 2002**
College of Ceramic Technology, Calcutta University, INDIA **Score: 70.5%**
Thesis title: "Development of Oxidation Resistant Graphite for Mag-carbon Refractories"
Advisor: Professor Panchu Gopal Pal

Employment History

- Assistant Professor** **November 2013- Present**
Department of Metallurgical and Materials Engineering
Indian Institute of Technology Kharagpur
- Assistant Professor** **August 2013- October 2013**
Department of Mechanical Engineering
BITS Pilani, INDIA
- Research Associate** **September 2012- July 2013**
Department of Bioengineering
University of Pittsburgh, USA
- Assistant Research Professor** **September 2011- August 2012**
School of Mechanical and Materials Engineering
Washington State University, USA
- Research Associate** **September 2010- August 2011**
School of Mechanical and Materials Engineering
Washington State University, USA
- Graduate Trainee Engineer** **August 2002- July 2003**
Pino Bisazza Glass PVT. LTD, INDIA

Awards and Honors

- *Invited talk* in Surface Properties of Biomaterials: Bioglass and Cellular Interactions symposium at Materials Science and Technology (MS&T) conference, Columbus, Ohio, USA, 2011.
- *Session chair* in Surface Properties of Biomaterials: Antimicrobial Coatings and Surface Analysis symposium at MS&T conference, Columbus, Ohio, USA, 2011.
- *Invited talk* in the School of Mechanical and Materials Engineering symposium series, Washington State University in Fall 2010.
- *Invited talk* in Surface Properties of Biomaterials: Biocompatible Coatings symposium at MS&T conference, Huston, Texas, USA, 2010.
- Third place in Willey Research Exposition, WSU, 2009.
- Outstanding graduate seminar speaker in Materials Science Program, WSU, 2006.
- Post-graduate scholarship granted by Govt. of India, 2005

Professional Experiences

Research Experiences

Tissue Engineering

Bone remodeling is a coordinated biochemical process of osteoclastic resorption and osteoblastic synthesis of new bone. I used different metal ion doping in tricalcium phosphate ceramic to control osteoclast formation and its activity. Presently I am studying the mechanisms of the metal ion dopants in controlling the differentiation of mesenchymal stem cells to bone cells and I am using tricalcium phosphate as a model material. I have also worked on brushite cement where I improved the mechanical and biological performance by infiltrating the cement with polyethylene glycol. Recently, I have worked on industry sponsored project on bisphosphonate drug delivery through plasma sprayed hydroxyapatite coating.

Surface Modification

Interface is the weakest zone in a calcium phosphate coated metallic implant. I prepared the calcium phosphate coatings using laser engineered net shaping (LENS™) where the sharp coating-substrate interface was altered to a diffuse interface. I have also worked on improving the phase purity and crystallinity of plasma sprayed hydroxyapatite coatings where I used inductively coupled radio frequency plasma spray. The *in vitro* biological and antimicrobial performances of the coatings were further improved by strontium, magnesium and silver doping. I have also used rat model to determine the *in vivo* performance of strontium doped hydroxyapatite coatings.

Teaching Experiences

MT 61142 (Spring 2015): Theory and Practice of Sintering

MT 41037 (Autumn 2014): Powder Metallurgy

MT 69011(Autumn 2014): Powder Metallurgy Lab.1

MT 61142 (Spring 2015): Theory and Practice of Sintering

ME/MF 215 (BITS Pilani): Mechanical Engineering Laboratory

Industrial Experiences

- Worked in the glass tile manufacturing company as shift-in-charge for production of glass tiles. I was also responsible for one continuous and several batch type glass melting furnaces.

Publications

Book Chapter

Roy M, Bandyopadhyay A and Bose S, “Chapter 7.2-Mechanical Properties of Coatings on Medical Implants” Ed. by Amit Bandyopadhyay Elsevier, pp: 311 (2013)

Journal Papers

I have published **22** journal papers and **2** conference proceedings. The papers have been **cited for 991 times** with an **h index of 15** (according to Google Scholar).

1. P Saha, **M Roy**, MK Datta, B Lee, PN Kumta, Effects of grain refinement on the biocorrosion and in vitro bioactivity of magnesium, *Materials Science and Engineering: C* 57, 294-303 (2015). [**I.F- 3.420**] (**Citation 2**)
2. Vahabzadeh S, **Roy M**, Bose S, Effects of silicon on osteoclast cell mediated degradation, in vivo osteogenesis and vasculogenesis of brushite cement, *Journal of Materials Chemistry B* 3 (46), 8973-8982 (2015) [**I.F- 4.872**] (**Citation 3**)
3. Vahabzadeh S, **Roy M**, Bandyopadhyay A, Bose S, *Phase stability and biological property evaluation of plasma sprayed hydroxyapatite coatings for orthopedic and dental applications*. *Acta Biomater* 17; 47-55 (2015). [**I.F- 6.008**] (**Citation 12**)
4. **Roy M**, Fielding G, Bandyopadhyay A and Bose S, “Effects of Zinc and Strontium Substitution in Tricalcium Phosphate on Osteoclast Differentiation and Resorption”- *Biomaterials Science* 1; 74-82 (2013). [**I.F- 3.614**] (**Citation 15**)
5. Bose S, **Roy M**, Bandyopadhyay A, “Recent Advances in Bone Tissue Engineering”- *Trends in Biotechnology* 30 546-554 (2012). [**I.F- 12.065**] (**Citation 392**) (**Presently ranked 9th most downloaded articles and 4th most cited article**)
6. DeVoe K, Banerjee S, **Roy M**, Bandyopadhyay A, Bose S, “Resorbable Tricalcium Phosphates for Bone Tissue Engineering: Influence of SrO Doping”- *Journal of the American Ceramic Society* 95, 3095-3012 (2012). [**I.F- 2.787**] (**Citation 2**)
7. **Roy M**, DeVoe K, Bandyopadhyay A, Bose S, “Mechanical and *In Vitro* Biocompatibility of Brushite Cement Modified by Polyethylene Glycol”- *Materials Science and Engineering: C* 32, 2145-2152 (2012). [**I.F- 3.420**] (**Citation 9**)
8. Fielding G, **Roy M**, Bandyopadhyay A, Bose S, “Antibacterial and biological characteristics of plasma sprayed silver and strontium doped hydroxyapatite coatings”- *Acta Biomaterialia* 8; 144-152 (2012). [**I.F- 6.008**] (**Citation 85**)
9. **Roy M**, and Bose S, “Osteoclastogenesis and Osteoclastic Resorption of Tricalcium Phosphate: Effect of Strontium and Magnesium Doping”- *Journal of Biomedical Materials Research A* 100A; 2450-2461(2012). [**I.F- 3.263**] (**Citation 34**)
10. **Roy M**, Fielding G, Beyenal H, Bandyopadhyay A, Bose S, “Mechanical and in Vitro Anti-Bacterial and Biological Properties of Plasma Sprayed Silver Doped Hydroxyapatite Coatings”- *ACS Applied Materials and Interfaces* 4; 1341–1349 (2012). [**I.F- 7.145**] (**Citation 57**)
11. **Roy M**, Krishna BV, Bandyopadhyay A, Bose S, “MgO Doped Tantalum Coating on Ti: Microstructural Study and Biocompatibility Evaluation”- *ACS Applied Materials and Interfaces* 4; 577-580, (2012). [**I.F- 7.145**] (**Citation 15**)

12. **Roy M**, Bandyopadhyay A, Bose S, “Induction Plasma Sprayed Sr and Mg Doped Nano Hydroxyapatite Coatings” *Journal of Biomedical Materials Research Part B: Applied Biomaterials* 99B: 258–265, (2011). **[I.F- 2.881] (Citation 40)**
13. Bandyopadhyay A, Krishna BV, **Roy M**, Bose S, “Laser Surface Modification of Metallic Biomaterials”- *Journal of the Minerals, Metals & Materials Society (JOM)* 6: 94-99 (2011). **(Citation 13)**
14. **Roy M**, Bandyopadhyay A, Bose S, “Induction Plasma Sprayed Nano Hydroxyapatite Coatings on Titanium for Orthopaedic and Dental Implants.”- *Surface and Coatings technology* 205; 2785–2792 (2011). **[I.F- 2.139] (Citation 86)**
15. **Roy M**, Krishna BV, Bandyopadhyay A, Bose S, “Compositionally graded hydroxyapatite/tricalcium phosphate coating on Ti by laser and induction plasma.”- *Acta Biomaterialia* 7; 866-873 (2011). **[I.F- 6.008] (Citation 34)**
16. Banerjee SS, **Roy M**, Bose S, “pH Tunable Fluorescent Calcium Phosphate Nanocomposite for Sensing and Controlled Drug Delivery.”- *Advanced Biomaterials (Advanced Engineering Materials)* 13[1-2]; B10-B17 (2011). **[I.F- 1.508] (Citation 17)**
17. **Roy M**, Krishna BV, Bose S, Bandyopadhyay A, “Comparison of Tantalum and Hydroxyapatite Coatings on Titanium for Applications in Load Bearing Implants.”- *Advanced Biomaterials (Advanced Engineering Materials)* 12[11]; B637-B641 (2010). **[I.F- 1.508] (Citation 19)**
18. **Roy M**, Bandyopadhyay A, Bose S, “Bulk Processing of Hydroxyapatite Nanopowder Using Radio Frequency Induction Plasma.”- *Journal of the American Ceramic Society*, 93[11]; 3720–3725 (2010). **[I.F- 2.787] (Citation 10)**
19. **Roy M**, Bandyopadhyay A, Bose S, “*In vitro* antimicrobial and biological properties of laser assisted tricalcium phosphate coating on titanium for load bearing implant.”- *Materials Science and Engineering: C*, 29[6]; 1965-1968 (2009). **[I.F- 3.420] (Citation 23)**
20. Bose S, **Roy M**, Das K, Bandyopadhyay A, “Surface Modification of Titanium for Load-Bearing Applications.” *Journal of Materials Science: Materials in Medicine*, 20[S1]; S19-S24 (2009). **[I.F- 2.272] (Citation 15)**
21. **Roy M**, Krishna BV, Bandyopadhyay A, Bose S, “Laser Processing of Bioactive Tricalcium Phosphate Coating on Titanium for Load-Bearing Implants.” *Acta Biomaterialia*, 4[2]; 324-333 (2008). **[I.F- 6.008] (Citation 90)**
22. **Roy M**, Bandyopadhyay A, Bose S, “Laser Surface Modification of Electrophoretically Deposited Hydroxyapatite Coating on Titanium” *Journal of the American Ceramic Society*. 91[11]; 3517-3521 (2008). **[I.F- 2.787] (Citation 18)**

Conference Proceedings

23. Roy M, Bandyopadhyay A, Bose S “Nanoscale Hydroxyapatite Coatings on Ti: Simultaneous Enhancement of Mechanical and Biological Properties.” *Ceramic transactions, Biomaterials Science: Processing, Properties, and Applications*, August (2011).
24. **Roy M**, Fielding G, Bandyopadhyay A, Bose S “Influences of Sr, Zn and Mg Dopants on Osteoclast Differentiation and Resorption.” *Ceramic transactions*, March (2012).

Presentations

I have given 11 seminars at different symposiums and academic institutions.

1. Fielding G*, **Roy M**, Bandyopadhyay A, Bose S, “Anti-Bacterial and Biological Properties of Plasma Sprayed Strontium and Silver Doped Hydroxyapatite Coatings”- MS&T, Columbus, Ohio, USA, October (2011).

2. **Roy M***, Bandyopadhyay A, Bose S, “Effect of Crystallinity on Dissolution Properties of Plasma Sprayed Hydroxyapatite Coatings”- MS&T, Columbus, Ohio, USA, October (2011).
3. **Roy M***, Fielding G, Bandyopadhyay A, Bose S, “Influences of Sr and Zn Dopants on Osteoclast Differentiation and Resorption” **Invited talk**, MS&T, Columbus, Ohio, USA, October (2011).
4. **Roy M***, Fielding G, Bandyopadhyay A, Bose S, “Anti-bacterial and biological properties of Plasma Sprayed Silver-Doped Hydroxyapatite Coating” MS&T, Columbus, Ohio, USA, October (2011).
5. **Roy M**, Bandyopadhyay A, Bose S*, “Induction Plasma Sprayed Nano Hydroxyapatite coatings doped with Strontium and Magnesium” Society for Biomaterials, Annual Meeting, Florida, USA, April (2011).
6. **Roy M***, Bandyopadhyay A, Bose S, “Nanoscale Hydroxyapatite Coatings on Ti: Simultaneous Enhancement of Mechanical and Biological Properties”- **Invited talk**, MS&T, Huston, Texas, USA, October (2010).
7. **Roy M***, Bandyopadhyay A, Bose S, “Osteoclastic Resorption of Doped and Undoped Beta-Tricalcium Phosphate”- MS&T, Huston, Texas, USA, October (2010).
8. **Roy M***, Bandyopadhyay A, Bose S, “*In Vitro* and *In Vivo* Characterizations of Induction Plasma Sprayed Hydroxyapatite Coating on Ti for Load Bearing Implants”- Society for Biomaterials, Annual Meeting, Seattle, WA, USA, April (2010).
9. **Roy M***, Bandyopadhyay A, Bose S, “Compositionally Graded Hydroxyapatite/Tricalcium Phosphate Coating on Ti by Laser and Induction Plasma Spray”- Society for Biomaterials, Annual Meeting, Seattle, WA, USA, April (2010).
10. Bose S, **Roy M***, Bandyopadhyay A, “Compositionally Gradient Calcium Phosphate Coating on Ti Using Laser and Induction Plasma Spray” Pacific Rim Conference on Ceramic and Glass Technology, Vancouver British Columbia, CANADA (2009).
11. **Roy M***, Bandyopadhyay A, Bose S, “Tricalcium Phosphate Coating on Ti Using LENS™”- MS&T, Pittsburgh, USA, October (2008).
12. **Roy M***, Bandyopadhyay A, Bose S, “Large Scale Synthesis of Nanoscale Hydroxyapatite Powders Using Induction Plasma Spray”- MS&T, Pittsburgh, USA, October (2008).
13. **Roy M***, Bandyopadhyay A, Bose S, “rf Plasma Sprayed Hydroxyapatite Coating on Ti”- MS&T, Pittsburgh, USA, October (2008).

Professional Activities

Reviewer

- I have reviewed articles from several journals which includes
 - Acta Biomaterialia
 - Journal of Biomedical Materials Research: Part B
 - Journal of the American Ceramic Society
 - Surface and Coatings Technology
 - Medical Engineering & Physics
 - Journal of Biomaterials Applications
 - Advances in Materials Science and Engineering
 - Biomatter
 - Tissue Engineering and Regenerative Medicine
 - Journal of Royal Society Interface
 - American Chemical Society- Applied materials and Interfaces
 - Transactions of the Indian Institute of Metals

- I have reviewed several conference papers which includes
 - Materials Science and Technology 2011
 - Society for Biomaterials 2011
 - Materials Science and Technology 2010

Fellow - Professional Body

1. Society for Applied Biotechnology

Member - Professional Body

1. Life Member: Society for Biomaterials and Artificial Organs (INDIA)
2. Life Member: Materials Research Society of INDIA
3. Life Member: Indian Institute of Metals
4. Life Member: The Indian Ceramic Society